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NON-LETHAL HANDGUN

by

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Background of The Invention

1. Field of the Invention

The present invention relates generally to handguns and, more particularly, to weapons designed for self-defense. Specifically, the present invention relates to handguns including revolvers and semi-automatic pistols which are nonlethal in design yet capable of delivering sufficient impact to stop an assailant.

2. Description of the Prior Art

Due to the actual or perceived threat of violence in today's society, firearms are more likely to be the weapon of choice for law enforcement personnel, the military and the public in situations where individuals believe that they must arm themselves in preparation for immediate retaliation or defense as a result of a threat of unknown force. Unfortunately, such firearms are typically weapons such as rifles, semi-automatic pistols and revolvers, all of which are intended to fire lethal projectiles which are intended to maim and/or kill.

As an alternative to lethal firearms, less lethal projectiles for firearms have been developed such as rubber bullets or fabric bagged bullets containing lead shot or heavy metal powder. Rubber bullets are generally relatively hard, are sometimes contained in a metallic core, and deliver their impact energy over a relatively small area. As a consequence, there is still a high probability of serious injury or even death to persons subjected to the impact of rubber bullets. Other types of nonlethal projectiles have been developed along with weapons for firing the same and are illustrated in U.S. patents No. 3,733,727, No. 5,221,809, No. 5,450,795 and No. 5,983,548.

A number of such non-lethal devices have been developed for use in circumstances that do not require lethal force. However, only a few have been sufficiently successful to be readily accepted. Some of these devices use a shotgun-size or larger caliber dedicated launcher to project a solid, soft projectile, while others use a smaller caliber launcher with variations of the rubber bullet concept to inject a tranquilizer drug or just stun the targeted person. Other defense methods used also include fire hoses, water cannons, mace, pepper spray and a variety of electric shock inducers.

Another technique for reducing the impact of projectiles involves the use of compressed gas. A variety of air and compressed gas guns are known and are capable of firing a variety of projectiles including BB's, lead pellets and paint balls. One common type of gun uses small cylinders containing compressed carbon dioxide. These metal cylinders have an end that can be punctured in order to release a high pressure gas. Guns of this type have been used for quite some time to fire lead pellets for purposes of game shooting and target shooting and more recently have been developed and adapted to fire paint pellets. These pellets are in the form of spherical gelatin capsules filled with a marking solution or paint. Guns that fire paint pellets are used in mock "war games" where the users of the guns attempt to hit other game participants with a paint color. Protective gear is worn to prevent inadvertent injury during such games. Examples of such compressed gas weapons are illustrated in U.S. patents No. 4,986,251, No. 5,349,939, No. 5,363,834, No. 5,634,456, No. 5,704,150 and No. 5,878,736. In addition, U.S. patent No. 4,173,211 discloses a pellet loading device for a pellet gun. Unfortunately, these devices either do not fire with sufficient impact to stop an assailant, or else they utilize small pellets which can in fact be extremely harmful and even lethal at times due to their ability to penetrate the human skin. As a

result, there remains a need for the general public as well as specific applications such as airplane pilots, policemen and riot control personnel, for a non-lethal weapon which has the capability of providing sufficient impact to temporarily debilitate an assailant yet is not designed to impart permanent injury or death. The present invention addresses this significant problem.

Summary of the Invention

Accordingly, it is one object of the present invention to provide a weapon for discharging high velocity, non-lethal projectiles.

It is another object of the present invention to provide a weapon for defensive use which avoids the use of deadly force.

Yet another object of the present invention is to provide a semi-automatic gun or revolver which is capable of stopping an assailant without the use of projectiles designed to penetrate the human body or materials such as aircraft windows or fuselage.

Still another object of the present invention is to provide an impact weapon which offers the consumer an alternative to deadly firearms for defensive purposes.

To achieve the foregoing and other objects and in accordance with the purpose of the present invention, as embodied and broadly described herein, a weapon is disclosed for discharging high velocity, non-lethal projectiles utilizing pressurized gas. The weapon includes a housing having a handle and a projectile storage cylinder sized and shaped to receive a plurality of substantially spherical-shaped projectiles. A discharge barrel is mounted proximate the projectile storage cylinder and has an open muzzle end and a closed base end, while a projectile loading chamber is disposed at the barrel base end and communicates with the

projectile storage cylinder. An enclosure is provided in the housing for receiving a removable pressurized gas storage source. A gas discharge cell communicates with the gas storage source in the enclosure and is adapted to receive a charge of compressed gas for selective projectile discharge. The weapon further includes a hammer and striker assembly for selectively releasing a charge of compressed gas from the gas discharge cell into the loading chamber to discharge a projectile through the barrel, and a trigger assembly selectively operates the hammer and striker assembly. Finally, a valve assembly is associated with the gas discharge cell and is adapted to permit selective variance of the compressed gas charge pressure released by the hammer assembly to correspondingly vary the velocity and impact of the discharged projectiles.

In one modification of the invention, the pressure of the gas charge released by the gas discharge cell may be selectively varied between 400-800 psig. per charge, while the removable gas storage source may be in the form of a replaceable gas cartridge disposed in the enclosure containing compressed gas of an amount sufficient for up to 20 charges. Additionally, the projectiles are preferably spheres, and the projectile storage chamber may further include a spring bias mechanism for urging movement of the spheres into the loading chamber. The spheres may preferably be made of solid or hollow aluminum, stainless steel, nylon or any other dense material, and are approximately 0.5"-0.8" in diameter and 5-10 grams in weight.

Another modification of the invention provides for a gas pressure gauge mounted on the weapon housing for indicating the pressure of the gas remaining in the storage source disposed in the housing enclosure. Moreover, the weapon may preferably be in the form of a semi-automatic pistol or revolver.

In another modification of the invention, the hammer and striker assembly may include a striker flange adapted for reciprocal movement between first and second striker positions, and a hammer element adapted for reciprocal movement between first and second hammer element positions. In this instance, a first spring bias member is included for urging the hammer element in a first direction from the first hammer element position to the second hammer element position to impact the striker flange and move it to the second striker position. A gas discharge valve is adapted for releasing a charge of gas from the gas discharge cell to the loading chamber upon movement of the striker flange to the second striker position resulting from impact by the hammer element. A cocking bolt is provided and is responsive to the release of gas from the gas discharge cell and is adapted to return the hammer element to its first hammer element position. The trigger assembly selectively retains the hammer element in its first hammer element position until release, and a second spring bias member returns the striker flange to its first striker position and closes the gas discharge valve.

Yet another modification of the invention includes a weapon for discharging high velocity projectiles utilizing pressurized gas wherein the weapon includes a housing having a handle and a projectile storage cylinder sized and shaped to receive a plurality of projectiles. A discharge barrel has an open muzzle end and a closed base end proximate the projectile storage cylinder, and a projectile loading chamber is disposed at the barrel base end and communicates with the projectile storage cylinder. An enclosure is provided for receiving a removable pressurized gas storage cartridge. A hammer assembly is included for selectively releasing a charge of compressed gas from the pressurized gas storage cartridge into the loading chamber to discharge a projectile through the barrel, and a trigger assembly selectively operates the hammer assembly. An improvement to this

weapon is provided wherein the weapon is adapted for discharging high velocity, non-lethal projectiles. To this end, the weapon includes a gas discharge cell communicating with the gas storage cartridge and which is adapted to receive a charge of compressed gas therefrom for selective release into the projectile loading chamber for projectile discharge. A valve assembly associated with the gas discharge cell is adapted to control the release of gas into the loading chamber for projectile discharge and to permit selective variance of the amount of compressed gas pressure released from the gas discharge cell in each charge to correspondingly vary the velocity and impact of the discharged non-lethal projectiles.

Another modification of the above improvement has the projectile storage cylinder in the form of a spring-loaded magazine which has a spring bias member for urging the non-lethal projectiles into the projectile loading chamber. Additionally or alternatively, a gas pressure gauge is disposed on the weapon housing for indicating the pressure of the gas remaining in the removable pressurized storage cartridge disposed in the housing enclosure.

In yet another modification of the above improvement, the valve assembly includes a conduit member interconnecting the gas discharge cell and the loading chamber, a gas discharge valve disposed in said conduit and adapted for releasing a charge of gas from the gas discharge cell to the loading chamber through the conduit member, and a valve seat for opening and closing the gas discharge valve. In one arrangement, the valve assembly further includes a projectile velocity adjustment knob for selectively varying the amount of gas discharged by the gas discharge cell into the loading chamber in any one single charge by selectively varying the volume of gas passing through the gas discharge valve into the conduit member when in an open position. In an alternate

arrangement, the projectile velocity adjustment knob selectively varies the amount of gas discharged into the gas discharge cell from the gas storage cartridge to vary the volume of gas in any one single charge for release into said loading chamber.

Still another modification of the invention provides for a semi-automatic pistol for discharging high velocity, non-lethal projectiles utilizing pressurized gas. The pistol includes a housing having a handle, a discharge barrel with an open muzzle end and a closed base end, a projectile storage cylinder sized and shaped to receive a plurality of aligned and substantially spherical-shaped projectiles and positioned adjacent and substantially parallel to the discharge barrel, and a sleeve for containing pistol operating elements. A projectile loading chamber is disposed at the barrel base end and communicates with the projectile storage cylinder, while an enclosure is provided in the housing for receiving a removable pressurized gas storage cartridge. A gas discharge cell is disposed in the sleeve for communicating with the gas storage cartridge in the enclosure and is adapted to receive a charge of compressed gas for selective projectile discharge. A hammer and striker assembly is also positioned in the sleeve for selectively releasing a charge of compressed gas from the gas discharge cell into the loading chamber to discharge a projectile through the barrel, while a trigger assembly selectively operates the hammer and striker assembly. Finally, a valve assembly is disposed in the sleeve associated with the gas discharge cell to both control the release of gas into the loading chamber for projectile discharge as well as permit selective variance of the amount of compressed gas pressure released from the gas discharge cell in each charge to correspondingly vary the velocity and impact of the discharged non-lethal projectiles.

A further modification of the invention is in the form of a revolver for discharging high velocity, non-lethal projectiles utilizing pressurized gas. The revolver includes a housing having a handle, a discharge barrel with an open muzzle end and a closed base end, and a revolving cylinder with a plurality of chambers each sized and shaped for each to receive a substantially spherical-shaped projectile. The chambers are positioned to successively align each one with the discharge barrel. An enclosure is provided in the housing for receiving a removable pressurized gas storage cartridge, while a gas discharge cell communicates with the gas storage cartridge in the enclosure and is adapted to receive a charge of compressed gas for selective projectile discharge. A hammer and striker assembly is provided for selectively releasing a charge of compressed gas from the gas discharge cell into one chamber of the revolving cylinder to discharge a projectile through the revolver barrel, and a trigger assembly selectively operates the hammer and striker assembly. Finally, a valve assembly is positioned associated with the gas discharge cell and is adapted to control the release of a gas charge into a chamber of the revolving cylinder for projectile discharge as well as to permit selective variance of the amount of compressed gas pressure released from the gas discharge cell in each charge to correspondingly vary the velocity and impact of the discharged non-lethal projectiles.

Brief Description of the Drawings

The accompanying drawings which are incorporated in and form a part of the specification illustrate preferred embodiments of the present invention and, together with a description, serve to explain the principles of the invention. In the drawings:

Fig. 1 is a side elevation view of a first semi-automatic pistol embodiment constructed in accordance with the present invention;

Fig. 2 is a side elevation view, with some parts in section and some parts in shadow, of a second semi-automatic pistol embodiment constructed in accordance with the present invention;

Fig. 3 is a cross-sectional view, with parts in elevation, of one gas discharge cell and valve assembly embodiment constructed in accordance with the present invention;

Fig. 4 is a bottom plan view of an alternate valve assembly control embodiment constructed in accordance with the present invention;

Fig. 5 is an end view taken substantially along line 5-5 of Fig. 4;

Fig. 6 is a partial side elevation view of the trigger assembly of the embodiment illustrated in Fig. 2;

Fig. 7 is an enlarged side elevation view of the trigger and cam components of the trigger assembly of the embodiment illustrated in Fig. 6;

Fig. 8 is a side elevation view, with some parts in section and some parts in shadow, of yet another semi-automatic pistol embodiment constructed in accordance with the present invention;

Fig. 8A is a cross-sectional view, with parts in elevation, of one gas discharge cell and valve assembly embodiment useful with the embodiment of Fig. 8 and constructed in accordance with the present invention;

Fig. 9 is a side elevation view, with some parts in shadow, of a revolver embodiment constructed in accordance with the present invention;

Fig. 10 is an enlarged side elevation view of one gas discharge cell and hammer and striker assembly embodiment constructed in accordance with the present invention for use with the revolver embodiment of Fig. 10;

Fig. 11 is an enlarged side elevation view of a projectile velocity adjustment member for use with the revolver hammer and striker assembly embodiment illustrated in Fig. 11; and

Fig. 12 is a cross-sectional view, with some parts in elevation, of the gas discharge cell and valve assembly embodiment illustrated in Fig. 10.

Detailed Description of the Exemplary Embodiments

Referring to Fig. 1, a non-lethal handgun 10 is disclosed and uses compressed gas to fire a lightweight aluminum or similar material projectile at sufficient velocity to cause significant pain upon impact but not penetrate the human body. This impact or striker gun preferably contains a replaceable gas cartridge as disclosed below and may fire up to six or more non-breakable projectiles or "bullets". In preferred form, the spherical bullets are approximately 0.5-0.8 inches in diameter, 5-10 grams in weight and are made of hollow stainless steel, although solid spherical bullets can be utilized as well. Preferably, the projectiles may be made of aluminum, stainless steel, nylon or any other appropriate dense material. Moreover, the replaceable gas cartridge may contain compressed carbon dioxide, nitrogen or air and preferably contains sufficient gas to discharge up to 20 bullets before replacement is necessary. As a result, the spherical bullets are fired at velocities up to approximately 300 fps. This projectile size, shape, weight and velocity combination is sufficient to stop an aggressive attacker at close range without causing fatal wounds. Although this gun is designed to be non-lethal, it is possible to still cause lethal injuries if a bullet were to strike a person at a vulnerable spot under certain limited circumstances. Nonetheless, the difference between the present invention and a typical firearm is that the prior art firearm is designed to fire a high velocity bullet that penetrates the

human body and causes severe internal injuries, while this device is not designed to do so.

The bullets of the invention can be solid or hollow and are preferably held in a straight, horizontal magazine as disclosed below. A spring mechanism as further discussed in greater detail is associated with the magazine to allow semi-automatic firing in several of the embodiments. The velocity of the spherical bullets allows them to hit the attacker with varying force as a situation requires, because the present invention includes a mechanism for varying and regulating the pressure utilized to discharge the projectiles as the circumstances warrant.

Referring again to Fig. 1, the handgun 10 of the present invention includes a housing 12 having a handle 14, a barrel 16 and a projectile or bullet storage cylinder or magazine 18. The barrel 16 preferably includes an open muzzle end 20 and a closed base end 22 serving as a projectile loading chamber. A plurality of preferably spherical projectiles 24 are disposed in the magazine 18 in aligned fashion and are maintained under slight compression by a muzzle spring member 26. The spring member 26 provides the force to urge a single projectile 24 into the projectile loading chamber 22 through a loading port 27 after a previously loaded projectile is fired from the barrel 16. While the exemplary embodiments are all handguns of one form or another, it should be understood that the present invention is not so limited and that any type of hand held weapon, i.e. rifles, handguns and the like, that embodies the inventive concepts disclosed and claimed herein.

An enclosure is provided in the housing 12, preferably in the handle 14 in this particular embodiment, which is sized and shaped to receive a replaceable gas storage cartridge, such as the CO_2 cartridge discussed above. The gas from the cartridge is directed into a gas discharge cell 28, after which the gas is then

injected one charge at a time into the projectile loading chamber 22 to discharge a projectile 18 from the barrel 16 as discussed in greater detail below. A trigger 30 and a hammer and striker assembly, as discussed below, are utilized to control the gas discharge and projectile loading processes. A velocity adjustment knob 32 is provided to adjust the amount of gas pressure per charge so as to adjust the velocity and impact of the projectile 18 leaving the muzzle opening 20. Finally, the gas pressure remaining in the gas cartridge is monitored by a pressure gauge 34 so that a user of the handgun 10 will know exactly how much charge is left for firing the weapon 10.

Referring now to Figs. 2-7, a second embodiment of the invention is disclosed in greater detail to illustrate the operation of the various operating components of the handgun of the invention. It should be noted that like components are identified with like numerals throughout all of the Figs. of this specification. In this embodiment, the handgun 10' is in the form of a semi-automatic weapon and, as in the previous embodiment, includes a housing 12, a handle 14, a barrel 16, a projectile or bullet storage cylinder or magazine 18', an open muzzle end 20, a projectile loading chamber 22, and a loading port 27. A plurality of preferably spherical projectiles 24 are disposed in the magazine 18 in aligned fashion and are maintained under slight compression by a muzzle spring member 26. The spring member 26 provides the force to urge a single projectile 24 into the projectile loading chamber 22 through the loading port 27 after a previously loaded projectile is fired from the barrel 16. In this particular embodiment, the magazine 18' is mounted over the barrel 16 and the rest of the housing 12. A rear opening 36 is provided in the end of the magazine 18', and a plug element 38 is threadably engageable therewithin. The projectiles 24 are loaded into the magazine 18' through the opening 36, and the spring member 26 is

engaged and tightened against the loaded projectiles 24 by the threading action of the plug 38.

A cylindrical sleeve 40 is formed in the housing 12 coaxial with the barrel 16 and is sized and shaped to contain the operating components of the gun 10', as described below. The handle 14, as described above, includes an enclosure 42 which is accessed through an opening 44 and maintained in a closed position by a closure member 46. A removable compressed gas cylinder or cartridge 48 is positioned within the enclosure 42 and provides the firing propellant for the projectiles 24. The operating components of the weapon 10' include a hammer and striker assembly 50, a gas discharge cell with valve assembly 52, a cocking bolt 54 adapted to move within a bolt slot 55, and a velocity adjustment control 56. A gas pressure gauge 34, as illustrated in Fig. 1, is included on the exterior side of the gas discharge cell with valve assembly 52.

In preferred form, the gas cartridge 48 is inserted into the enclosure 42 but not activated until needed by twisting the loading closure member or knob 46, which presses the cartridge 48 into place and causes the end 49 of the cartridge 48 to puncture. Appropriate seals 51 may be utilized to hold the gas pressure until needed. The seals 51 may hold the gas pressure after the cartridge end 49 is punctured for months. As previously stated, an integral pressure gauge 34 indicates the pressure remaining in the cartridge 48. The gauge 34 informs the user that the cartridge end 49 has been punctured and that sufficient gas remains for firing. The gas then passes from the punctured end 49 through a tube 58 into the gas discharge cell 52. A valve assembly 60 is provided in the discharge cell 52 for rapidly delivering a charge of expanding gas, which preferably varies from 400-800 psi, into the loading chamber 22, upon pulling the trigger 30, to propel a

projectile 24 out of the barrel 16. The valve assembly 60 is integrally associated with the hammer and striker assembly to accomplish this.

Referring now with particularity to Figs. 2 and 3, a hammer element 62 is maintained in position within the sleeve 40 by a trigger assembly 64, as described in greater detail below. A discharge conduit 66 extends from its open ~~distil~~ distal end 68 in the loading chamber 22 along the sleeve 40 through the gas discharge cell 52 and terminates in a threaded adjustment portion 70 exterior to the housing 12. The hammer element 62 is disposed along the conduit 66 and is adapted to move longitudinally therealong. A striker flange is fixed to the conduit 66 between the hammer element 62 and the distil end 68 of the conduit 66 and is sized and shaped to engage the impact end 74 of the hammer element 62 when the hammer element 62 is moved along the conduit 66 through the sleeve 40. A spring member 76 engages the opposite end of the hammer element 62 to provide a bias force against the hammer element 62 to urge it along the conduit 66 toward the striker flange 72, the trigger assembly 64 maintaining the hammer element 62 in its "cocked" or "loaded" condition with the spring member 76 under compression. A sliding bolt 78 is mounted to the end of the conduit 66 proximate the distal end 68 thereof. When the trigger assembly 64 is released by the pulling of the trigger pull 30, the spring member 76 forces the hammer element 62 quickly along the conduit 66 to impact the striker flange 72 with the surface 74, and this action moves the striker flange 72 along with the associated conduit 66 longitudinally within the sleeve 40. It also moves the sliding bolt 78 axially into the loading chamber 22 to slightly impact the projectile 24 therein while simultaneously blocking the loading port 27.

The gas discharge cell 52 is preferably in the form of a sealed cylinder 80 having a front seal 82 through which the conduit 66 passes, which is further sealed

by an O-ring 84, and a rear seal 86 abutting a rear retainer 88, through which the conduit 66 also passes. A valve port 90 is provided in the conduit 66 within the cylinder 80 of the cell 52 proximate the rear seal 86. When the port 90 is open to the interior of the cylinder 80, discharge gas passes therein into the conduit 66 and rapidly along its length until it is discharged out of the distil end 68. When the valve port 90 is closed by engagement within the rear seal 86, no gas is discharged through the conduit 66. A valve seat 92 is secured to the conduit 66 adjacent the valve port 90, and a spring member 94 engages a front plate 96 at the front seal 82 and the valve seat 92 within the cylinder 80. The spring member 94 is adapted to urge the valve seat axially toward the rear seal 86 so as to normally maintain the valve port 90 in a closed position within the seal 86.

When the conduit 66 and all of the components attached thereto, i.e. the striker flange 72, the sliding bolt 78 and the valve seat 92, are moved axially within the sleeve 40 toward the conduit distil end 68 upon impact of the hammer element 62 against the striker flange 72, the valve port 90 is momentarily opened and exposed to the interior of the cylinder 80. At this moment, compressed gas within the cell 52 rushes into the valve port 90 down along the length of the conduit 66 and out of the distil end 68 to propel the projectile 24 in the loading chamber 22 out of the barrel 16 along with a slight impact provided by the sliding bolt 78. However, the primary propellant is the compressed gas discharged out of the distil end 68. Therefore, the force imposed on the projectile 24 and the resulting impact provided by the projectile against its target is directly dependent on the amount and resulting force of gas discharged at the distal end 68. This, in turn, is then directly dependent on the amount of time the valve port 90 is open and exposed to the interior of the cell 52.

As previously stated, the threaded adjustment portion 70 of the conduit 66 is disposed exterior to the housing 12. The velocity adjustment knob 56 is threadably engaged over the adjustment portion 70 so that the inner adjustment plate 98 of the knob 56 is designed to impact the rear retainer 88 when the conduit 66 is moved longitudinally by the hammer element 62 and thereby terminate the longitudinal travel of the conduit 66 and the components attached thereto. Thus, the greater the distance between the rear retainer plate 88 and the inner adjustment plate 98, the greater the distance traveled by the conduit 66, which in turn means the longer the valve port 90 remains in an open position and the greater the amount of gas in the gas charge imposed on the projectile 24. Likewise, if the distance between the rear retainer plate 88 and the inner adjustment plate 98 is decreased, the time the valve port will be in an open position is also decreased thereby decreasing the gas discharge volume and resulting projectile impact force. Consequently, the force of the fired projectiles may be readily varied from shot to shot by simply turning the velocity adjustment knob 56.

It should also be noted that once the spring member 94 within the cell 52 has urged the valve seat 92 against the rear seal 86 and thereby closed the valve port 90, the spring member 76 along with the spring member 94 co-act to return the hammer element 62 to its initial "loaded" position. When this occurs, the trigger assembly engages the hammer element 62 to retain it in this position until the trigger pull 30 is pulled once again. Moreover, when the hammer element 62 returns to its initial position, the striker flange 72 and sliding bolt 78 also return to their respective initial positions. This action resets the striker flange 72 for another impact by the hammer element 62, and the return movement of the sliding bolt 78 opens the loading port 27. This action by the sliding bolt 78 in turns enables the

spring member 26 in the magazine 18' to urge another projectile 24 from the magazine 18' automatically into the loading chamber 22 to ready the gun 10' for another firing. In addition, the cocking bolt 54 is attached to the hammer element 62 and moves therewith. Since the bolt 54 projects out of the slot 55, the hammer element 62 may be manually cocked to engage the trigger assembly 64 therewith by pulling the bolt 54 rearwardly.

Referring now to Figs. 2, 6 and 7, one preferred form of the trigger assembly 64 is disclosed. In this embodiment, the assembly 64 includes a trigger pull 30 which is pivotally attached to the housing 12 by a pivot pin 100. The trigger pull 30 includes a forward extension arm 102 and a rearwardly extending cam 104 which includes a cam surface 106. A trigger control arm 108 is mounted on a slide pin 110 and includes a cam pin 112 extending from a first end thereof to engage the cam surface 106 of the trigger pull 30. The second control end 114 of the trigger control arm 108 is adapted to selectively engage a catch 116 on the hammer element 62 to maintain the hammer element 62 is its loaded position in opposition to the bias force of the spring member 76. When the trigger pull 30 is moved rearwardly in the direction of the arrow 118, the cam surface 106 rotates the cam pin 112 and disengages the control end 114 from the hammer catch 116, thereby releasing the hammer element 62 to move forwardly within the sleeve 40 as described above. When the hammer element 62 returns to its starting position, the catch 116 reengages the control end 114 to retain the hammer in its loaded position until the trigger pull is again moved rearwardly.

A safety pin 120 is positioned forward of the trigger pull 30 and is adapted to move laterally relative to the longitudinal axis of the housing 12 and includes a thick portion 122 and a thin portion 124, as illustrated.. The forward extension arm 102 is sized so that it will strike the pin 120 when the trigger pull 30 is pulled

rearwardly in the direction of the arrow 118. In this manner, when the pin 120 is in its safety position, the thicker portion 122 of the pin 120 engages the forward extension arm 102 so that the trigger pull is incapable of being moved rearwardly a sufficient distance to disengage the control end 114 from the catch 116. When the pin 120 is moved laterally to present the thin portion 124 for engagement with the forward extension arm 102, the control end 114 disengages from the catch 116 permitting the hammer element 62 to move.

As described above with respect to the embodiment of Figs. 2 and 3, the projectile 24 velocity is controlled by adjusting the amount of compressed gas released from the discharge cell 52 into the loading chamber 22 by changing the position of the velocity adjustment control 56 on the conduit adjustment portion 70. Another way of controlling the velocity of the projectiles 24 is by varying the amount of gas introduced into the cell 52 from the cartridge 48 through the seals 49 while maintaining the control member 56 in a stationary position. This accomplishes the same end as the prior technique. A third manner of controlling the velocity of the projectiles 24 is by providing the same gas pressure in each gas charge transferred from the cell 52 into the loading chamber 22, and then venting varying portions of the discharged gas in the loading chamber to thereby adjust the total gas pressure pushing the projectile 24 out of the barrel 16. One arrangement for accomplishing this third adjustment technique is illustrated in Fig. 4. A vent opening 126 is provided in the bottom portion of the barrel 16 at the loading chamber 22. A slide tube 128 is then mounted snugly over the barrel 16 so as to cover the vent opening 126. The slide tube 128 includes an oblong aperture 130 which may be aligned in part or in whole over the vent opening 128 so that a portion of the gas discharged into the loading chamber 22 is vented through the vent opening 128 and the aperture 130. By adjusting the position of the aperture

130 over the vent opening 128, a variable amount of gas may be vented thereby variably decreasing the amount of gas available to discharge the projectile 24 through the barrel 16.

Referring now to Figs. 8 and 8A, another embodiment of the present invention is disclosed. In this embodiment, a semi-automatic handgun 10" is illustrated and includes a housing 12, a handle 14, a barrel 16, a projectile or bullet storage cylinder or magazine 18", an open muzzle end 20, a projectile loading chamber 22, and a loading port 27. A plurality of preferably spherical projectiles 24 are similarly disposed in the magazine 18 in aligned fashion and are maintained under slight compression by a muzzle spring member 26. The spring member 26 provides the force to urge a single projectile 24 into the projectile loading chamber 22 through the loading port 27 after a previously loaded projectile is fired from the barrel 16. In this particular embodiment, as in the prior embodiment of Fig. 2, the magazine 18" is mounted over the barrel 16 and the rest of the housing 12. A front opening 132 is provided in the forward end of the magazine 18", and a plug element 134 is threadably engageable therewithin. The projectiles 24 are loaded into the magazine 18" through the opening 132, and the spring member 26 is engaged and tightened against the loaded projectiles 24 by the threading action of the plug 134.

Unlike the prior embodiment which positioned the operating components in a sleeve coaxial with the barrel 16, the present embodiment includes a separate tubular element 136 as part of the housing to enclose the operating components. The forward end of the tubular element 136 includes an end opening 138 which has a threadable knob 140 securable thereto. An enclosure 42' is positioned in the forward portion of the tube 136 to carry the gas cartridge 48 which is inserted into the enclosure 42'. As in the prior embodiment, the cartridge 48 is activated when

needed by twisting the loading closure member or knob 140, which presses the cartridge 48 into place and causes the end 49 of the cartridge 48 to puncture. Again, appropriate seals 51 may be utilized to hold the gas pressure until needed. The seals may hold the gas pressure after the cartridge end 49 is punctured for months. As previously stated, an integral pressure gauge 34 (Fig. 1) indicates the pressure remaining in the cartridge 48. The gas then passes from the punctured end 49 directly into the gas discharge cell 52'. A valve assembly 60' is provided in the discharge cell 52' for rapidly delivering a charge of expanding gas into the loading chamber 22, upon pulling the trigger 30, to propel a projectile 24 out of the barrel 16. The valve assembly 60' is integrally associated with the hammer and striker assembly 142 to accomplish this.

In this particular embodiment, the trigger assembly 64 is arranged the same as in the previous embodiment of Figs. 2-7. The hammer 144 is positioned for longitudinal movement within the tubular element 136 and is attached to the cocking bolt 54 by way of a pin 146, the cocking bolt 54 and slot 55 being positioned above the tubular element 136 behind the barrel 16. A hammer spring 148 functions in the same manner as the spring member 76 of the prior embodiment, that is to create a bias force against the hammer 144 to urge it towards a striker 150 to activate the gas discharge cell 52'. When the hammer 144 is released by the trigger assembly 64, the hammer 144 travels down the tubular element 136 and impacts the striker 150. Once the striker 150 is impacted, the spring 148 returns the hammer 144 back to its loaded position, and the trigger assembly 64 releasably locks the hammer 144 in position for another projectile round to be fired.

The gas discharge cell 52' of this particular embodiment is modified slightly from that of the prior embodiment. In this embodiment, the cell 52' preferably

includes a gas input opening 152 through which compressed gas from the cartridge 48 passes to the interior of the cell 52'. The cell 52' is divided into two portions, an input portion 154 which receives the gas from the input opening 152, and a gas discharge portion 156. A wall seal 158 divides the two portions. A gas conduit 66' extends from the input portion 154 through the wall seal 158, into the discharge portion 156, through a rear seal element 160 and terminates as the striker 150. The conduit is hollow from its end opening 160 up to where it becomes the striker element, which is a solid end portion thereof. A valve port 90' is positioned in the conduit 66' similar to the prior embodiment, and a valve seat 92' is secured to the conduit 66' adjacent the valve port 90'. A spring member 94' engages the wall seal 158 at one end and the valve seat 92' at its opposite end. The spring member 94' is adapted to urge the valve seat 92' axially toward the rear seal element 160 so as to normally maintain the valve port 90' in a closed position within the seal element 160.

When the hammer 144 impacts the striker member 150, the striker member 150 is moved longitudinally inwardly into the cell 52' against the bias spring 94'. When this occurs, the valve port 90' is moved into the gas discharge portion 156 and opened to interior thereof. When this occurs, compressed gas in the input portion 154 rushes into the conduit 66' through the opening 160, out through the valve port 90' into the discharge portion 156, and out through a gas loading duct 68' into the loading chamber 22 to propel a projectile 24 out of the barrel 16. The greater the impact from the hammer 144 onto the striker 150, the further the valve port 90' is inserted into the discharge portion 156 of the cell 52', and the longer the valve port 90' is placed in an open position. This in turn creates a greater amount of compressed gas flow into the gas loading duct 68' and the loading chamber 22, creating a greater velocity to the projectiles. A velocity adjustment knob 56' is

disposed at the terminal end of the tubular element 136 and is threadably secured thereto against the spring 148. Therefore, velocity adjustment for this embodiment is accomplished by turning the adjustment knob 56' to create greater or reduced bias force against the hammer 144 by the spring 148, which in turn creates, respectively, greater or reduced impact force of the hammer 144 against the striker 150. It should be understood, however, that other arrangements for the cell 52' may be devised and still be within the scope of the present invention.

Another embodiment of the present invention is illustrated in Figs. 9-12. In this particular embodiment, a revolver 170 is illustrated. Again, it should be understood that like parts carry like numerals. In this embodiment, a housing 12, a handle 14, a barrel 16, a projectile or bullet storage cylinder 172, an open muzzle end 20, and a projectile loading chamber 22'. The handle 14, as in the embodiment of Fig. 2, includes an enclosure 42 which is accessed through an opening 44 and maintained in a closed position by a closure member 46. A removable compressed gas cylinder or cartridge 48 is positioned within the enclosure 42 and provides the firing propellant for the projectiles. The operating components of the weapon 170 include a hammer and striker assembly 174, a gas discharge cell with valve assembly 176, a cocking bolt 178, and a velocity adjustment control 180. A gas pressure gauge 34, as illustrated in Fig. 1, is included on the exterior side of the gas discharge cell with valve assembly 176.

In this arrangement, a rotating cylinder 172 carries a plurality of projectiles within a plurality of chambers 182. In this instance, a single chamber 182 is aligned with the barrel 16, and when the gun 170 is discharged by pulling the trigger pull 30, a single projectile is fired with the cylinder 172 then rotating an amount sufficient to align the subsequent cylinder 182 with the barrel 16 utilizing compressed gas from the cartridge 48. The gas discharge cell 176 is a cross or

combination in structure and operation between those of the two prior embodiments illustrated respectively in Figs.2-3 and Figs.8-8A. In this instance, the cell 176 includes a cylinder 184 having a forward seal 186, a rear seal 188 and a rear impact plate 190. A first conduit 192 is provided and includes an open gas discharge end 194 disposed at the projectile loading chamber 22' and is open at its opposite end 196 to the interior of the cell 176 on the discharge side of the wall seal 186.

A second conduit 198 is provided and includes an open end 200 aligned with the end 196 of the first conduit 192, and a closed opposite end which terminates in the form of the striker element 202. The second conduit 198 passes through both seals 186, 188 and the rear impact plate 190 so that the striker element 202 projects outwardly from the plate 190. A valve port 204 is disposed in the second conduit 198 and is adapted to be covered by the rear seal 188 under normal circumstances. A valve seat 206 is attached to the second conduit 198 at the valve port 204, while a compression spring 208 is disposed between the forward wall seal 186 and the valve seat 206 to create a bias force to urge the valve seat 206 and the valve port 204 closed and sealed within the rear seal 188. When the striker element 202 is impacted by the hammer 210, the valve port 204 is momentarily opened. When this occurs, compressed gas from the cartridge 48 passes through a valve assembly duct 212 into the cell 176, through the valve port 204 to the first conduit 192 and then into the loading chamber 22 to fire a projectile from a chamber 182 and out the barrel 16.

The hammer 210 is preferably mounted to pivot on a pin 214 and is maintained in a cocked position by a velocity adjustment control arm assembly 180. The assembly 180 includes a control arm 216 pivotally mounted to a pivot pin 218, a spring member (not illustrated) for creating a bias force against the hammer

210 similar to spring members 76 and 148 of the prior embodiments to urge it to a forward position to impact the striker element 202, and a control lever 220 mounted to the pin 218 and adapted to move the control arm 216. The hammer 210 includes at least two and preferably more notched portions 222 which are sized to receive the end of the control arm 216. When the trigger assembly is activated by pulling the trigger pull 30, the control arm 216 is disengaged from its notched portion 222, and the hammer then rotates around the pin 214 to impact the striker 202. The further back the hammer 210 is pulled and maintained by the control arm 216 and the notched portions 222, the greater the impact of the hammer 210 on the striker 202, which in turn increases the time the valve port 204 is open which thereby increases the amount of compressed gas passing into the loading chamber 22 to fire a projectile from a chamber 182.

As can be seen from the above, a non-lethal handgun is disclosed which utilizes compressed gas to fire a lightweight aluminum or similar metal bullet at sufficient velocity to cause severe pain but not to penetrate the human body. As discussed above, the projectiles can be solid or hollow and are fired at velocities generated by gas pressures of from 400-800 psi per firing. The variable velocity setting capability of the present invention allows the bullets to hit the attacker with mild to severe force as the situation requires. For example, a smaller assailant might warrant a mild setting while a larger assailant with a life-threatening attack may well warrant a severe impact setting. The bullets can be brightly colored or even fluorescent to make them more visible when fired as well as aid in aiming, similar to tracer bullets.

Manually pulling back the cocking bolt of any of the embodiments of the invention places the gun in an armed position by pulling back the hammer, loading the first bullet and then allowing gas to enter the valve assembly. Pulling the

trigger activates the hammer, opens the valve and allows gas to enter the bolt assembly, thereby discharging a bullet. The trigger is spring-loaded, and the return action loads the next bullet and refills the valve with gas for the next firing, allowing for semi-automatic firing of the bullets in several of the embodiments.

Loud noise is also an important factor in deterring an attacker. Because of this, the weapon of the present invention may incorporate a valve/hammer/bolt and barrel design that maximizes the "bang" sound produced by the expanding gas when firing the gun. Also, the surface profile of the bullets themselves can be shaped in such a way as to produce a sound in flight that can be heard by the attacker as the projectiles speed by, letting the attacker know that he is being shot at.

Prior art firearms utilize levers and springs to accomplish loading of bullets into the firing chamber, firing the bullets, discharging the spent shells, and the like. Having gas pressure available with the present invention allows the invention to use pneumatics to accomplish all of these functions and more. The pneumatics of the invention allow the weapon to control the exit velocity of the projectiles, which cannot be done with a typical firearm. Moreover, in a typical firearm the amount of gun powder is pre-loaded in the shell of a bullet. The pneumatics of the present invention, however, allows one to control functions away from the trigger providing more design freedom and configuration options. Moreover, prior art firearm bullets are dangerous in and of themselves since they contain gun powder and can explode when struck or overheated. The present invention permits projectiles to be loaded and be completely safe until the gas cartridge is activated. It is also equipped with a safety button that locks the trigger and keeps it from moving.

The energy contained in compressed gas is considerable. The energy contained in liquefied compressed gas such as carbon dioxide is even more

powerful. A standard 12-gram carbon dioxide gas cartridge, as disclosed above, has sufficient power to fire up to 20 of the solid aluminum projectiles at a mild velocity setting or 10 projectiles at the severe impact velocity. Since there is generally more gas available in one gas cartridge than needed to fire an entire projectile magazine, some of the excess gas can be utilized to maximize the "bang" sound as discussed above. Because there is no gun powder involved in the weapon of the present invention, a non-lethal gun constructed in accordance with the present invention can be completely wet yet still fired successfully. It can even be submerged and then used successfully. While the present invention does not have the deadly stopping power of a high velocity bullet fired from a prior art firearm, such deadly force is generally not necessary to deter many typical crimes. Moreover, there are many situations where deadly force is either not needed, wanted or even permitted by law. In fact. many states prohibit the use of deadly force unless one's own life or the lives of one's family are at stake. Many crimes do not involve this type of situation, such as burglaries, vandalism, robberies and the like where your own life is clearly not in danger. As a result, severe bruises inflicted on a criminal utilizing a weapon constructed in accordance with the present invention would very likely stop the crime in progress or at least provide a temporary time break, permitting one to flee in safety.

The present invention is especially useful since it does have the capability of varying the force with which a projectile is shot as well as provides a visual indicator of the gas remaining for firing additional projectiles. None of the prior references provide such accommodation features in a non-lethal weapon which is specifically designed to deter crime, rather than to provide entertainment.

The foregoing description and the illustrative embodiments of the present invention have been described in detail in varying modifications and alternate

embodiments. It should be understood, however, that the foregoing description of the present invention is exemplary only, and that the scope of the present invention is to be limited to the claims as interpreted in view of the prior art. Moreover, the invention illustratively disclosed herein suitably may be practiced in the absence of any element which is not specifically disclosed herein.